May, 1954

THE CHEMIST

VOLUME XXXI NUMBER 5

DR. JAMES SCOTT LONG, F.A.I.C.

Receives Ohio Award

(See page 175)

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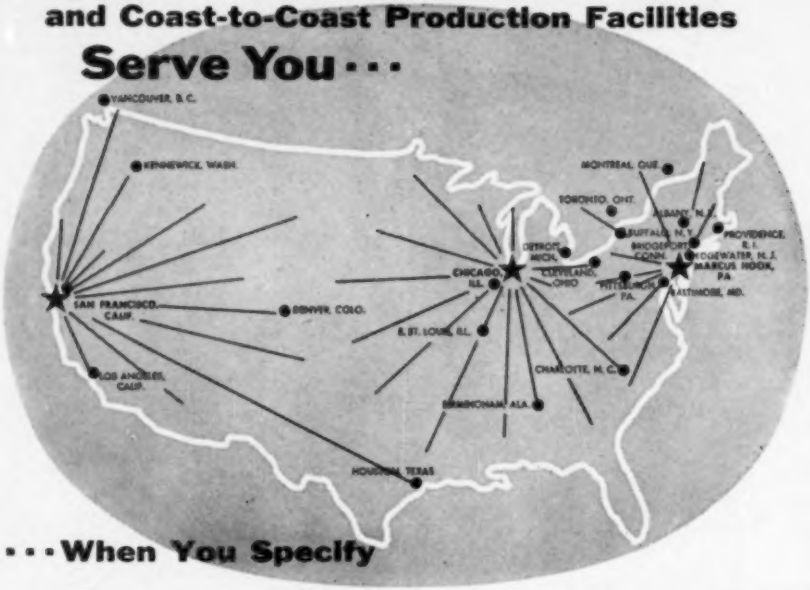

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SCHEDULED FOR EARLY PUBLICATION

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Sixteen Years of Chemical Education in China, Dr. Peter P. T. Sah

The Research Chemist in the Pharmaceutical and Medicinal Chemical Industries, Dr. Randolph T. Major, F.A.I.C.

Advice on the Submission of Inventions and Ideas to Large Corporations (a reprint), Marvin Small.

What Is a Fellow? Dr. Ernest H. S. Van Someren, F. Inst. P.

The Promising Field of Fluorochemicals, R. M. Adams

Award of New Jersey Chapter Honor Scroll to Dr. P. A. van der Meulen

Annual Meeting Proceedings

IN THIS ISSUE

TO COME

The June issue of THE CHEMIST will be devoted to the proceedings of the Thirty-first Annual Meeting. Splendid professional papers were given at that meeting. Some of them have great future significance. One panel was devoted to "The Legal Aspects of a Chemist's Life," it includes a proposed contract for chemists that will be submitted to readers for comment. Another panel concerns education. General session papers cover "Security Versus the Challenge of a Vital Life," "Psychological Problems," and other factors. Dr. William Joseph Sparks, medalist, brings an important message.

TO SERVE YOU

EDITORIAL

The New Fiscal Year

As we begin the new fiscal year this May, we welcome new officers and councilors. Dr. Donald B. Keyes, president-elect, New York Representative for Arthur D. Little, Inc., 420 Lexington Ave., New York 17, N.Y., succeeds the retiring president, Dr. Lincoln T. Work. The new president-elect is Dr. Ray P. Dinsmore, vice president in charge of research and development of The Goodyear Tire and Rubber Co., Akron 16, Ohio. Re-elected as secretary is Dr. Lloyd Van Doren, chemical consultant, patent causes, Watson, Leavenworth, Kelton & Taggart, 100 Park Ave., New York 17, N. Y. Re-elected as treasurer is Dr. Frederick A. Hessel, commercial manager, Commercial Development Department, General Aniline & Film Corp., 435 Hudson St., New York, N. Y.

New councilors, to serve for three years, are Dr. Emil Ott, director of research, Hercules Powder Company, Wilmington 99, Del., and Dr. William J. Sparks, director of the Chemical Division, Standard Oil Development Co., Linden, N. J. Re-elected councilor for three years is Dr. John R. Bowman, director of research, Department of Research in Physical Chemistry, Mellon Institute, Pittsburgh 13, Pa. The twelve AIC Chapters are holding elections of officers, one of whom will be a representative from each Chapter to the National Council.

A meeting of the National Council will be called for June 16, 1954, at which committees for the new year will be appointed and confirmed. Committees now serving have been retained for the interim period until June 16th.

The June issue of The Chemist will carry the proceedings of the 31st Annual Meeting that concludes the fiscal year 1953-54, with its splendid progress toward AIC objectives. The new fiscal year is full of promise and with the cooperation of the membership new achievements can be made.

Facts Opposed to Fancy

The true worth of the scientist-over-forty to industry is revealed in the article on page 189, entitled "Employment Problems of Chemists Over Forty Years of Age." Every chemist or chemical engineer can matrially aid the profession by reading this article and bringing it to the attention of others. Its message can have far-reaching effects in restoring to science those abilities that the older person (contrary to popular belief) excels in. (Reprints of this article will be available at modest cost.) The individual who would like specific suggestions is referred to the article, "Placement After Middle Life," by Dr. L. T. Work, F.A.I.C. in The Chemist, Nov. 1953.

As a chemist, you shoulder an increasing amount of responsibility. Your processes, your finished products, your firm's reputation – all these depend in a large measure upon your work in the laboratory.

And you, of course, for accurate results must depend upon the proper tools and equipment of which laboratory chemicals are among the most important. Supplying you with AR's that are always exactly as you expect them to be – always pure, always available, and always dependable – is *our* responsibility, and one we take seriously. We know that *you* can't carry out *your* responsibility unless *we* carry out *ours*.

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The Chemist in Paint Technology

Dr. James Scott Long, F.A.I.C.

Chemical Director, Devoe & Raynolds Company, Louisville 1, Kentucky

(Acceptance address, here condensed, when Dr. Long received the Ohio Award of the Ohio AIC Chapter, Louisville, Ky., April 9, 1954.)

This information-packed paper shows how chemists introduced science into an ancient and honorable industry; offers some business advice; outlines future research projects; gives tips on better use of paints in plant and home; suggests the future, and concludes with a bit of philosophy.

WE HAVE put some science into the paint business. The "we" is purposeful, because in a corporation's research laboratory, credit for achievements should go to the research and development workers. When I was a professor at Lehigh, some twenty papers in the *Journal of Industrial & Engineering Chemistry* carried my name; also some patents. These also carried other names, Larry Scott, George Ball, and others, who did the real work and no small part of the thinking. When we came to Louisville, Al Rheineck and Ben Rabin started on fundamental research precisely where they left off at Lehigh. George Ball developed the Two-Coat house paint system; of which the One-Coat house paint was an outgrowth, largely at the hands of Wally Hoback and Butch Schumacher. The brilliant young chemist, S. O. Greenlee, Ph.D., with help from many others, developed the epoxy resins. Earhart, Rabin, and Stauderman developed the Dowtherm Kettles that put science into the cooking of varnishes and resins. No one accidental, epoch-making event was involved in our industry's progress.

The primary purpose of business is to make profit. It is happy indeed when a chemist can follow the results of his work and see tangible results in doing good to people. In my industry we see results. A new paint is soon visible.

Francis Bacon (17th Century) wrote that there are two reasons for the study of science: "For the glory of God and for the relief of man's estate." Today two symbols express these incentives: The question mark and the dollar sign. They correspond somewhat to the objectives of pure and applied science. To render service is a pleasure; but to do so, your product must be sold and used. To sell, it must meet one or more of the basic desires of humans: Security, Comfort, Health, Power, Recognition, Life Eternal. Try to relate your new product or improvement to

one or more of them. But even so, you can fail. We developed a flat paint containing 5% DDT. It killed insects and did not lose its effectiveness, and thus we felt our product protected health. But due to a scarehead article by a physician, people were afraid, and would not buy it. It is good, but it was a flop even before some flies developed some immunity. Other bugs did not develop immunity. But in general, if you can relate a product to one of the basic desires, you will help to ensure great business success. The paint industry has tried to do this.

Here are some facts: (1) as late as 1935, white lead in pure raw linseed oil was the standard white paint. Three coats were applied to a new house, two to a repaint job. (2) Interior flats were based on lithopone as pigment and ester gum varnish as vehicle. (3) Varnishes were cooked in small open kettles, hand-stirred over gas, oil, or coke fires. Two to ten per cent of the oils and resins decomposed. These decompose seriously at 300°C, but the temperature on the bottom of the kettles was 700°C. Chimneys or stacks forty-feet high were needed to control fumes. (4) Chinawood oil and oil soluble phenolic resins came in during the first 20-years of the 20th Century. Their varnishes dried in four hours and were quite resistant to water and mild alkali. (5) Most vehicles were essentially esters, very susceptible to hydrolysis. (6) Chemists were doing analytical work, control testing of paints, some formulating and exterior exposure work. Accelerated testing was coming in vogue.

Let us see what happened in the intervening twenty years.

The advent of titanium dioxide and let- down titanium pigments dates from 1920. By 1935, the price was competitive and the advantages were appreciated. Titanium dioxide has a hiding power eight to nine times that of white lead. Thus hiding power can be achieved in one coat that formerly required two or more. Raw linseed oil paints penetrate deeply into wood. Little of the first coat remains above the surface when dry. Chemists, knowing that linseed oil thickens when cooked, decided to cook the oil enough so that it would penetrate to only a depth of two wood cells, which leaves most of the first coat film above the wood. The rest was the careful detail of many experiments and time-testing.

An undercoat is now standard practice. Given care in thinning and application, it provides a sound foundation for the finish coat and gives better results. The undercoat must be adapted to the pigments to be used. Experiments showed that zinc soaps leach out of a film several times more rapidly than lead soaps. Both form in films if basic pigments are present, Now moisture comes out through the stud spaces of houses

from the operations of living inside. This often condenses to water in the stud spaces in winter time, and so it rains nearly every cold night in the stud spaces of nearly all frame houses. The presence of zinc oxide and hence zinc soaps in the undercoat is a factor conducive to peeling. The formula was then based on titanium and lead pigments, plus structural non-hiding inerts. In other words, the undercoat was designed on factual knowledge of physics and chemistry.

The finish coat must have durability and beauty. Ultraviolet light is the primary destructive agency for paint films. The organic vehicle is destroyed in the tiny thin surface layer. The pigment surrounded by this layer is now loose and can be rubbed off. We say the paint is chalky. Rain washes this chalk down. Then the sun destroys the oil in the second little layer of paint; more pigment comes loose to be washed down, and so through the entire film of paint. In this mechanism, the pigment shields the vehicle below it from ultraviolet. The higher the hiding power, the slower the chalking rate. But if a good alkyd resin is the vehicle instead of linseed oil, the chalking rate can become so slow that the paint does not clean its face quickly enough in an environment of chimneys and furnaces. The paint must be designed to maintain a proper balance between erosion rate and cleanliness.

Film Density

Insufficient consideration has been given to film structure. We do refer to it as a property of the film when considering: (*a*)The ability of the film to be washed, without getting water behind it. (*b*)Enamel hold-out (*c*)Ability to wash off stains. (*d*) Gloss. But, except rarely, we do not design the paint to have a certain film structure or density, expressed by a number and planned to either let water through from the inside or keep it out from the exterior. It can be done.

In recent years, several papers deal with oil absorption, critical volume and structure. Unfortunately, we lack certain fundamental data, e.g. we do not yet know the number of layers of molecules of a vehicle that are oriented by absorption forces into the surface of the pigment. Only the oil beyond these layers is unoriented; random arrangement. The volume of oil or vehicle in the voids is determined by the thickness of the oriented layers. We must determine the number of layers of molecules of several types of vehicles, absorbed and oriented on the surface of a number of pigments and inerts, and also must have the specific surface of each of our pigments. We can then draw a quantitative picture of the inside structure of our films and know what to expect in change of properties as we vary proportions. In masonry finishes, we want a porous film to transmit water from beneath with-

out blowing blisters. In paints for steel, we want a dense film that will not allow water to go in and cause rusting. But we must be more exact than this. Transmission data for both water and water vapor are needed for paints involving a number of factors varied progressively to give transmission curves.

Paints for Metal

Red lead, long used, is hard brushing, heavy, poisonous, slow-drying, and expensive but it is rust inhibitive. Brownish red iron oxide, so widely used, lacks these defects but it is not rust inhibitive. It can be used as diluent in a metal primer. There are six rust-inhibitive pigments. However our knowledge is poor. Rust is dependent on the kind of metal but we do not know the correlation completely and we make little effort to use the kinds of iron alloys that are slow to rust, nor do the steel companies help much. A new lease of life on metal paints is needed and is coming. The Federation of Paint and Varnish Production Clubs is considering a program to assign segments of the problem to different individual clubs, and then as data accumulate, put the mosaic together. We contemplate a five to ten year program involving ten to twenty universities, a thousand men, and perhaps $100,000 in cash. We hope to learn about corrosion.

"The corrosion of steel is a function of both environment and composition . . . The life of a paint system on steel depends on the corrosion resistance of the steel . . . " Larabee in *Corrosion*, Aug. 1953

Carbon steel containing 0.2 per cent Cu, or more, has one and one-half to four times the atmospheric corrosion resistance of steel containing only 0.01 to 0.02 per cent Cu. Despite this, chemists test the efficiency of primers on steel plates about which they know very little. Our new program will embrace perhaps 48,000 panels from 240 exactly prescribed melts.

Active corrosion in industrial plants could be lessened or prevented by four procedures: (1) Do not paint over rust barnacles. Scrape them off. (2) The primer must contain proper substantial amounts of Ph_3O_4, $PbCrO_4$, Blue Lead, $ZnCrO_4$, $SrCrO_4$, or ZnDust. Neither aluminum or Fe_2O_3 are rust inhibitive. (3) The vehicle must be able to withstand the chemicals involved, e.g., chlorinated rubber, vinyls, epoxies, etc. Esters hydrolize. (4) The film thickness must be great to prevent water and electrolytes from penetrating to the metal surface. These four things will be successful in an empirical way in saving your plants. Our research program will bring, in time, more economical and better methods and products.

For the home, on all outside metal objects, use zinc dust primer. That also applies to galvanized metal on your plants. Zinc dust primer is the only paint that sticks to galvanized

iron. I do not know why it works, but we use other things without knowing the theory. We can design molecules to dry rapidly—make them big and complicated. Consider the guiding law: $KE = 1/2\ MV^2$. If M is big, V becomes low and as motion decreases, the product becomes a solid or gel. Start with an M where V is low at the start. To make a vehicle resistant to water and alkalies, choose one with a low hydrolysis rate, e.g., an ether rather than an ester. We can greatly improve water resistance, but we do not have a correlation on resistance to sunlight (ultraviolet), so we do not have a basis for design of molecules for outside exposure. Alkyd resins are excellent, reason unknown. So there is one for the future. It is absurd for us not to have such a principle at our command.

Manufacture of Vehicles

The vehicle is what pigments ride in: Oil or varnish or resin, natural or synthetic, latex emulsions, vinyls, epoxies, etc. From ancient times, open kettles were used for processing. In 1936, we began to design cooking equipment on a scientific basis. We determined the specific heats of drying oils and resins over the temperature ranges. We designed a jacketed stainless steel, closed kettle, using Dowtherm (diphenyl and diphenyl oxide) as the hot vapor in the jacket. The contents of the kettle were heated by transmission, through the walls, of the latent heat given out as the Dowtherm changed from vapor to liquid. The vapor came from the boiler up 350°C under a series of pressures. It condensed and returned to the boiler. The contents of the kettle were not overheated. The gradient was low. Decomposition losses were very small. In addition, we combined the reactants in the presence of non-reactive solvent. But temperatures necessary for fast esterefication range from 230 to 300°C, and any solvents left in the batch have to be volatile enough to escape rapidly from the film after the product is painted out on the surface. Petroleum hydrocarbons such as mineral spirits, were logical solvents, but their BP range is 150°C to 200°C. The difficulty was solved by Raoult's law. The rise in BP is proportional to the number of solute molecules per liter, i.e. to the concentration, so we introduced not 50 per cent of solvent, but 5 per cent, and so achieved solutions with a BP of 300, even though the BP of the solvent was 200. The solutions boiled and bubbled in the closed kettle which was equipped with condensers, fractionating traps, mechanical stirrer, thermometer, pressure gauge, and inert gas outlets. The resultant resins showed less decomposition, better color and odor. The reaction was carried more nearly to completion and the curve of molecular distributions was more uniform.

Flat Wall Paints

Flat wall paints are a good barometer of the way in which science makes itself felt. The first was probably whitewash; lime and water, and a little salt. Then calcimine; glue plus clay or whiting, and a few other things. Then the "oil type flats" that used lithopone as pigment and processed oils (heat polymerized, blown, sulfur chloride treated) plus some resin such as ester gum to speed drying. The washable flats had a bit of modified phenolic resin and enough vehicle to coat the pigment particles. Soon all the companies began to make flat wall paints and competition became more acute. Prices became ridiculously low and quality suffered.

Then came the latex emulsion paints. The first were pigment emulsions of butadiene-styrene copolymer. They were easy to apply, dried rapidly, spots could be retouched; they were washable and odorless. Thus they introduced new features that people wanted. (The odorless feature bears on the basic desire of comfort.) The easy-to-apply feature gave impetus to the "Do-It-Yourself" market.

(Dr. Long then discussed the emancipation of women from drudgery by electricity and modern labor saving devices, and quoted from a remarkable article, "The Electrical Home" by Frederick J. Nash, published in *Ainslee's Magazine* in 1900. Nash, another Jules Verne, accurately prophesied the modern, electrified home.)

In the "Do-It-Yourself" program, women can be their own "interior decorators" and not only plan the decoration of the home but carry out the plan. The woman with a roller coater and odorless flat wall paint can get a good job with little inconvenience. The cost is trifling. So the paint industry has emancipated women one step further and made them independent of the painter. The rubber emulsion (latex) paints were a big factor in opening up this idea, but the new alkyd resin type enamels are displacing them.

The alkyd resin was originally developed by General Electric Company. It combined phthalic anhydride, glycerine, and non-drying fatty acids, such as those from cottonseed oil, into a baking resin. Later Kienle substituted drying oil fatty acids for the non-drying and made resins that air-dry. The alkyd resin has outstanding features: (1) the film is tough. (*a*) Alkyds made from soybean fatty acids do not turn yellow. (3) Alkyds as a class withstand sunlight (ultraviolet) better than practically any other commercial vehicle. Consequently this vehicle has gradually displaced the chinawood oil phenolics and others in many industrial uses. In the architectural field, it has come in as gloss and semi-gloss finishes. Now it has invaded the largest field—flat wall paint. But there is no static condition. Research moves on. We need more data on oil absorption, PVC,

pigment particle size distribution, consideration of packing effects, free oil. General principles must be worked out so we can create paints to do a specific job. We have not yet set up the laws with which to quantitatively design a paint, which among other things will have, a desired water transmission rate in grams|sq. ft.| hour|inch of Hg. (Perms). This is a prelude to stop the peeling of paint from frame houses.

Epoxies

The development of epoxy resins was not accidental. As it unfolded, especially as the patent structure developed, it embodied to a fair extent the idea of predetermined design. The properties of various modifications of members of the family could be fairly well prophesied. These resins are made fundamentally from epichlorohydrin and bisphenol. In general, they contain reactive OH and Epoxy groups. The latter react with any active hydrogen at relatively low temperatures, so cross-linking is in order. These resins "cure" by reaction with amines, such as tetra ethylene pentamime, at room temperature, and will also "bake." The films have high resistance to abrasion and to solvents and alkalies. Resistance to acids is more selective—poor to sulfuric above 70% H_2SO_4 or to nitric. This development has been sublicensed to Shell and to Carbide and Carbon. The significant feature is that it becomes possible to design to prescription what we want, even in the field of resinous materials.

Masonry Finishes

The painting of masonry involves consideration of three factors: (1) Fresh masonry is alkaline or "hot," meaning that it will react with oils or other esters and saponify them at least partially. (2) The surface is often porous, and (3) In some areas, masonry has a high percentage of water. These difficulties are pretty well solved with resins like chlorinated rubber, vinyls, and epoxies. They are so resistant to alkali that a concrete foundation could be painted the day the forms are taken down. The porosity or suction of surfaces such as cement or cinder blocks can be overcome by mixing three or four pounds of coarse pigment (as sand or whiting) into a gallon of these paints. One can paint as soon as a test shows that the rate at which water is leaving the surface is so low that the water can diffuse through the film without blowing bubbles or blisters. Ascertain this by applying a little paint to a wall and watch what happens over a weekend. If there are no bubbles or blisters under a 10-power glass, it is safe to paint. We visualize more extensive painting of masonry surfaces now that science has overcome the difficulties. Intrinsic adhesion to a surface, e.g. masonry, is dependent upon certain oxy or polar groups that are strongly attracted to and oriented upon the surface. Epoxy

resins have excellent adhesion. Coatings of this type can be expected to adhere well to masonry.

The Future

We have seen that our knowledge is deficient on (1) correlation of ultraviolet resistance to molecular composition; (2) corrosion of iron alloys. Paint should be made functional to (*a*) kill bacteria, (*b*) be fire resistant, and (*c*) be constructed on the basis of predetermined design. As we replace empirical knowledge with principles, the four-year testing period for exterior products will become unnecessary. The present accelerated tests are not sure enough, so the products we sell are four years behind laboratory developments.

We will create paints to protect concrete highways. We will make paints to stand higher temperatures. Artists' oil colors will dry quickly and be more permanent, in both color and film integrity. Automobile enamels will not hold dirt so tenaciously. Resins will partially replace metals—marine paints will protect hulks more effectively. These I mention to stimulate imagination.

If our knowledge of laws and principles progresses to where we can do things by predetermined design, then we need imagination. If market surveys show that an idea will pay, the chances are strong that it can be done. Based on the research outlook, paints in the year 2000 will be quite different both in composition and functions, and selling and distribution will also be different.

I have used illustrations from the paint industry to suggest an idea. The idea deals with purposed progress. Now this is one universe, from the solar system of the atoms to the solar systems of the stars, and everything between is governed by the same laws. It is a purposeful universe. God intended each of us to have and to play a part in its progress toward goals at present indistinct to us, but certainly for each there is a purpose that deals with the kind of progress here portrayed. My hope is that you find your specific assignment and follow it with unquenchable desire.

Dr. James Scott Long

E. F. Musterman

Vice President of Operations, Devoe & Raynolds Company, Louisville, Ky.

(Presented when Dr. Long received the Ohio Award of the Ohio Chapter of The American Institute of Chemists.)

DR. J. S. LONG received the Ch.E. degree in 1913 and the M.S. degree in 1915, from Lehigh University. He did some graduate work at Columbia University and took the Ph.D. degree at John Hopkins Uni-

versity in 1921. He started in the Chemical Department at Lehigh as assistant, and was successively instructor, assistant professor, associate professor, and professor of chemistry.

Almost from graduation he served as consultant for the Chester Enameling Company, Chester, Pa., and carried on extensive research which led to the production of patent leather that showed a minimum tendency to crack.

In 1927, he organized a cooperative research project between Lehigh and a group of companies headed by Archer-Daniels-Midland, producers of linseed and other drying oils, together with a number of other companies, such as the William O. Goodrich Company of Milwaukee, the Raybestos-Manhattan Company, the New Jersey Zinc Company, the Armstrong Cork Company, Columbus Union Oil Cloth Company, and others. These companies contributed to a common research fund of which Dr. Long was research director, and work was carried on to extend the frontiers of knowledge of oil chemistry and its allied fields of usefulness through the acquisition of the fundamental principles and data on drying oils. This work resulted in a number of patents taken out by the companies concerned, twenty primary scientific papers published in *Industrial and Engineering Chemistry,* and many less technical papers.

At about this time the paint and varnish industry was endeavoring to inject chemistry into its field of operations. There was a time when companies producing paint and varnish looked with great disfavor on chemists. I know of several instances where the companies that employed chemists actually hid them on the lot so some of their customers would not know they had engaged the services of chemists!

Shorty Long was one of the people who lifted the industry from the days of the old "spit-in-the-kettle" art of the varnish maker to the place where new compounds designed for specific uses were blue-printed in the laboratory. Devoe & Raynolds were one of the earlier companies to recognize the need for the paint and varnish industry to become a chemical industry.

Dr. Long left Lehigh in 1934 to join the Devoe & Raynolds Company as chemical director. Since then he has done an outstanding job in the paint industry and has been one of the men most instrumental in having the paint industry take its place in the chemical field.

In 1947, Dr. Long was voted one of the ten outstanding scientists in the paint, varnish, and plastic field by the Chicago Section of the American Chemical Society. In 1949, he served as a delegate from the American Federation of Paint and Varnish Production Clubs to read two papers at the Industrial Fair at Basle, Switzerland; and at the Oil and Colour Chemists Association Convention of

Bute, Scotland, on the subject of "Film Formation, Film Properties, and Film Deterioration." By request, he repeated his paper at a meeting of the O.C.C.A. at Birmingham England. With a representative from England (Dr. Jordan) and one from France (Lucien Revel), he helped organize the Federation of the Western Nations of Europe.

In 1952, Dr. Long was elected a Fellow of the Royal Society of Arts in England. Also he was appointed "Distinguished Professor" at the University of Louisville to conceive and administer the graduate programs in the field of oils, paints, and resins, leading to the Ph.D. degree. He has lectured at the University of Louisville each year since 1934.

He is co-author of *Chemical Calculations* (with H. V. Anderson); *Qualitative Analysis* (with H. V. Anderson and T. H. Hazlehurst), and *Elementary Experiments on Non-Metals* (with D. S. Chamberlain and M. K. Buckley). He has just completed a large volume on paint, to serve as the paint "bible" for architects. It is written from the A.I.A. point of view and will be published this year.

Dr. Long is a member of Theta Xi, Tau Beta Pi, Sigma XI, and Omicron Delta Kappa. He is a member of the Society of Chemical Industry of England, the Textile Chemists Association, American Oil Chemists Association, American Concrete Institute, and the American Chemical Society. He is a Fellow of THE AMERICAN INSTITUTE OF CHEMISTS. He is past chairman of the Lehigh Valley Section of the American Chemical Society, and of the Paint and Varnish Division of the American Chemical Society; and has served on the Research and Education Committees of the Federation of Paint and Varnish Production Clubs. He is a trustee of Lee's Junior College at Jackson, Kentucky.

The Federation of Paint and Varnish Production Clubs has asked him to give the 1954 Mattiello lecture. At the Federation's 1953 convention, Dr. Long was presented with the George Baugh Heckel award for outstanding achievement and most significant contributions to the science of protective coatings.

The amazing thing to me about Shorty Long is his attitude toward his work, coupled with his versatility. It has long been thought that men of science are reticent speakers, but not so Shorty Long. He has the happy faculty of being able to reduce a technical subject to the level of the homeowner or painter so they understand and enjoy hearing what he has to say. He can talk to anybody on any level. To say he is an extrovert, would be understatement. He travels more than 75,000 miles a year, and will talk to almost any who will listen to him. He gives often as many as three talks in one day. For instance, he might this morning have talked to a Women's Club on "The

Effect of Color on Your Personality"; this afternoon to a group of architects, and this evening to hard-swearing, hard-drinking painters, who still contend that "lead-and-oil" is the only way to make house paint, and Shorty will charmingly insist that lead has no place in house paint.

Dr. Long has been an outstanding scientist for years, yet he is constantly asked to talk to sales groups on salesmanship. He has given numerous such talks to some of the largest corporations in America. It may seem odd for a chemist to tell successful sales groups how to sell; but he gets many requests to do so. One of his talks, "The Greatest Salesman" (the Apostle Paul) has been put into print by our company.

He spends a considerable portion of his time on the spiritual side of life. He is the teacher of a quite unusual Men's Bible Class, composed of business men, at the Second Presbyterian Church in Louisville. I have heard him speak at various Church meetings, and it has amazed and amused me to see that even in teaching his Sunday School class, Shorty never drops the role of salesman. While assisting the student in his climb toward Eternal Life, he always manages to instill into him some of the virtues of Devoe's Wonder One-Coat House Paint!

Dr. Long is versatile; a research man of high order with a tremendous number of scientific papers to his credit; a leader in the design of paint products and the machinery to make them; a great teacher and salesman; and a genuine leader in his chosen profession.

Dr. N. A. Lange presents Ohio Award to Dr. Long

Presentation

THE OHIO AWARD was presented to Dr. James Scott Long, F.A.I.C., chemical director of Devoe & Raynolds Co., by the Ohio AIC Chapter, at a dinner meeting held at the Brown Hotel, April 9th, in Louisville, Kentucky.

Dr. Norbert Lange of Handbook Publishers, Inc., Sandusky, Ohio, and chairman of the Ohio Chapter, presented the scroll. E. F. Musterman, vice president of operations of Devoe & Raynolds, spoke on Dr. Long's career. Dr. Long's acceptance ad-

dress was entitled, "The Chemist in Paint Technology." (See preceding articles.)

The Award was made to Dr. Long *for achievement in chemistry which has brought distinction to the chemical profession and the Ohio Chapter.*

New Consulting Group: Florida Chemists and Engineers, Inc., 1709 North Mills St., Orlando, Florida, organized by Robert A. Nanz, F.A.I.C., and Dr. James B. Redd, to serve the fast-growing industrial area in Florida. Mr. Nanz was formerly with Foster D. Snell, Inc., of New York, N.Y., and with the Crown Can Company, Orlando.

Honored: Dr. John E. McKeen, Hon.AIC, by the Cuban Red Cross with the Grand Cross and Ribbon of the Order of Honor and Merit. The presentation was made in Havana in March by Brig. Gen. Evelio Figarola, chief of the Cuban Red Cross. Dr. McKeen was cited for his achievements in the field of antibiotic research and production.

National Guard Asks Support

To the Secretary:

I am writing to ask your assistance for the National Guard's current recruiting effort. Your support, and that of other patriotic American organizations, is necessary to help the Guard fulfill its assigned mision as a strong, effective part of our national defense.

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Inclosed is a booklet explaining what the Guard means to American business, and a check list of available recruiting materials. If you wish copies of either or both for your members, please let us know.

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Edgar C. Erickson, *Major General*
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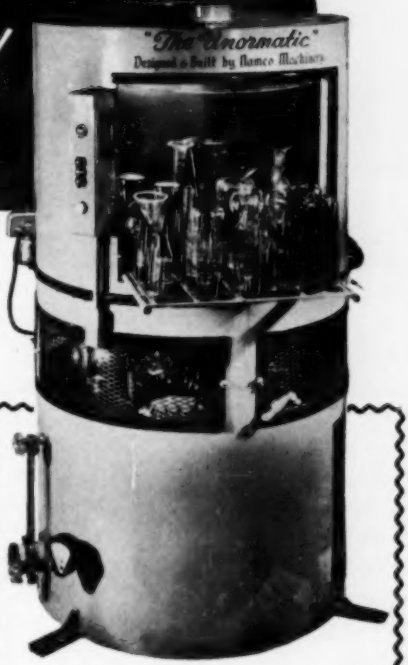

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Employment Problems of Chemists Over Forty Years of Age

Dr. Margery J. Mack

Director of Retirement Planning Project, the Industrial Relations Center, Chicago, Ill.

(Presented at a recent meeting of the Chicago AIC Chapter.)

Here are scientific facts so widely at variance with popular concepts that this article should be read by every chemist, young or old; in or out of management.

PROFESSIONAL persons make up eight and one-half per cent of the labor force today, and chemists less than one-half of one per cent. Most studies of skills and performance of older workers have been carried out on the groups who make up the bulk of the labor force—the skilled, semi-skilled, and clerical workers. Therefore, in assessing the skills of the older chemist, we can only draw implications from what is known in general about older workers to the problems of chemists themselves in finding employment after the age of forty. But chemists are people—and we will not go too far astray in drawing such analogies.

Why is There a Problem of Employment After Forty?

General conditions in our country which have combined to create employment problems for older persons are the great increase in the number and proportion of older persons, urbanization, industrialization, and American attitudes toward aging.

Urbanization is responsible for[1] drastic and probably irreversible changes in the structure of the family which have served to displace the older person. Further, he is no longer an economic asset to his family. Industrialization with its stress on strong, young bodies and its fixed age of retirement has not proved congenial to the older worker as farming once was. And our traditional high regard for youth and indifference toward the aged have compounded the problem, preventing us from facing it realistically, and instilling in us prejudices against the worth of older persons.

Specific reasons offered by industry for not hiring older persons have to do chiefly with costs (insurance and pension), and physical changes.

What Solutions to the Problem Are There?

What arguments do we have to offer industry to encourage them to reverse their policy on hiring older workers? Are they sound? How

would they look to us if we were doing the hiring, and had to show a profit?

The Right to Work

In line with traditional American standards, the right to work by everyone able should be our concern. We cannot realistically increase life expectancy by twenty years and at the same time deny people the opportunity to support themselves in these added years.

How might this argument look to industry? They might say: Good—we certainly agree. But we must also think in terms of dollars and cents. And they must. Let's try another.

Our Labor Force is Getting Older

The startling increase in our older age groups in the past half-century is common knowledge. While our total population has doubled since 1900, our 65-plus group quadrupled and our 45-64 group tripled. The end is not yet in sight. By 1975, it is estimated that persons of 45 and over may increase to 63-million, or one-half of all the population over 20. The oldest age group is expected to increase 69 per cent to 21-million; the 45-64 group 40 per cent to 42-million, but the 25-44 group only 20 per cent to 54-million.

In other words our accustomed source of labor supply is shrinking in proportion. Additional sources lie in only two groups—the older worker, and women. Also, the next six or seven years will find us reaping the harvest of the depression years when the birth rate was low. There will be fewer young people available for the labor force.

How might this argument appeal to industry? They might reasonably reply: Well, O.K., we'll hire older people if we have to, as we did during the war. But we'd still like a positive argument. Do they offer us the efficient, productive, profitable labor force we want?

Dollars and Cents of Older Workers

The crux of the argument is this: How do older workers compare with younger workers in terms of costs, skills and productivity?

Costs: Some erroneous notions exist about costs. Accident and absenteism rates are demonstrably lower among older workers. But the number of days lost per illness are greater. Therefore costs are probably a little greater, although factors such as medical examinations at the time of hiring would minimize them.

Group life insurance costs, since they are based on age, are higher, but the use of a group average age reduces the effect of any single person's age on the rate.

The area of greatest importance is pensions, since pension costs are higher for hiring the older person. His turnover is lower and there is less time for his pension money to earn interest. However, provision for delayed retirement, or the waiving of pension

rights by older workers would reduce pension costs.

Conclusions on costs are summed up well by A. R. Mathieson, president of United States Steel and Carnegie Pension Fund:

> To sum up this discussion of costs, it is indicated that the costs of workmen's compensation insurance, accident and sickness, and hospitalization and surgical insurance are not materially increased by the inclusion of older people in the work force. The costs of group life insurance and pensions, however, are affected to a greater degree by the employment of older persons, but in my opinion not to a degree which preclude the employment of qualified older workers.[1]

Skills and Productivity: Little objective evidence exists on which to generalize about age, but what has been accumulated is generally favorable to the older worker. It can be considered from two aspects: productive capacity, and mental abilities.

1. *Productive capacity*: Both field studies and laboratory studies of older workers have been carried out: Many field studies have used the opinions of companies who have compared their older with their younger workers. A typical study in terms of results is reported by Temple University.[2] Using six industrial types of companies employing more than 500: Agriculture; Construction; Manufacturing; Transportation, Commerce and Public Utilities; Trade, Finance and Real Estate; and Service, with five categories ranging from Highly Favorable to Generally Unfavorable, they found these results regarding Productivity, Dependability, etc., of older workers: Depending upon the industrial type, from 13 to 39 per cent of older workers were in the Highly Favorable range; 18 to 60 per cent were in the Generally Favorable range; most of the balance fell in the Same as Younger Workers range.

One Personnel Manager of a public utility company employing over 3,000 workers made this statement, which is fairly representative of industry's attitude: "The quantity of production of production-workers starts to fall off at age 55 but the quality is as high or higher. Since the older worker is more dependable he is still an asset to us."

Probably the most thorough laboratory study made to date was conducted by Welford in England.[3] He concludes:

a. A new skill is more slowly acquired by older persons, but once mastered is performed with facility unless continuous pressure for speed is demanded.

b. Maintenance of a skill is easier than acquiring a new one, especially in terms of comprehending and relating to past experience.

c. Individual differences are marked. (The highest individual scores

[1] Mathieson, A. R., "Costs of Insurance and Pension as a Barrier to Employment of Older Persons," *Age Barriers to Employment*, p. 151. Pennsylvania: Temple University, 1953.
[2] Mullen, J. H. "The Costs of Retaining Older Workers in Industry," Ibid., p. 195.

[3] Welford, A. T. *Skill and Age*. London: The Nuffield Foundation, 1951.

were often made by older persons.)

d. Older persons are especially suitable to work requiring precision, since they are more careful and accurate.

Dr. Shock of the United States Public Health Service reports from his laboratory work that: (1) speed more than anything else shows a decrement with age, but where work involves habits established through exercise and use, speed shows little change, and (2) there is a wide range of individual differences.

These studies as well as numerous others emphasizing the vast range of individual differences among older persons, certainly point up the unreality of judging people by their age rather than their ability.

Generally speaking, in most studies older workers prove superior in these qualities: Loyalty, reliability, accuracy, judgment, skill, experience, and wisdom, all of which companies customarily report more than make up for any loss in speed or productive capacity which may have occurred.

2. *Mental Abilities*: Here again, there is not enough material from which to generalize. Studies of mental abilities have been for the most part limited, superficial, inadequately controlled, or inappropriate to older persons. However, two studies of superior men are relevant to professional groups. The first was a longitudinal study of college men reported by Owens.[4] He studied mental abilities by retesting middle-aged subjects with the same instrument used with them when they were college students. He found no measurable change in their scores after an interval of 32-years.

Sward[5] compared college professors aged 60 to 80 with a control group of 45-colleagues aged 25 to 35. He felt that the two groups were roughly comparable in motivation and initial ability. Again, individual differences were more marked than age differences. Sward felt losses that were apparent were the result of disuse and artifacts of the particular tests used. He concluded that age had the effect of slowing the rate of mental operations rather than of impairing their quality or accuracy.

A significant finding from most intelligence tests is that those who do well are less subject to loss of the abilities measured than those who make mediocre or inferior scores.

In discussing learning ability Kaplan[6] states that it is reasonable that older persons would have an advantage in certain types of learning material. For example, if a 25-year old chemist and a 50-year old colleague were to be compared in digesting and comprehending an article in a professional journal, it is quite possible that the older man would win out because of his greater familiarity with the field.

[4] Kaplan, Oscar J., "Psychological Aspects of Aging," *Annals of American Academy of Political and Social Science*, Vol. 279, Jan. 1952, p. 37.
[5] Ibid.
[6] Ibid., p. 35.

How have we made out with industry in this third argument—the one that counts? We have shown that the costs of hiring older persons are less than most employers think, and that certain measures can reduce them still more. We have shown that older workers have many valuable, dollars-and-cents assets to offer industry. We have shown that mental abilities do not decline with age as rapidly or as greatly as has been supposed. And we have shown a paradox. Industry itself is generally high in its praise of its older workers and usually wishes to retain them. But it does not wish to hire them.

More research on abilities and productivity, and the kinds of jobs older persons are best suited to; wider use of job analyses; development of criteria for hiring and selectively retiring older workers; better education of management and the public; retraining opportunities for older workers; publicity of findings—these are the factors that will turn the tide in favor of increased opportunities for the mature worker. A good deal has already been accomplished, and a great deal more will be.

How About Chemists?

What can we say about the older chemist as a result of what we know about the older worker in general?

All the positive qualities of older workers so far demonstrated favor the older chemist. Accuracy, better judgment, reliability, experience, loyalty, lower accident rate and less absenteeism—these are qualities which, by the very nature of his work, make the older chemist valuable. At the same time, and again by the nature of his work, he is not penalized by the negative qualities of older workers—decline in speed and power.[7]

Creativity

So far so good. But the crucial question among many employers appears to hinge around "creativity." The general attitude is that only the very young chemist is very creative. How justified is this belief?

Professor Lehman's careful work on the relation of age and achievement[8] sheds some light on this subject. His twenty years of research on intellectual achievement in the fields of science, art, and literature, have produced some disturbing and challenging conclusions. Using 933 significant published contributions to the science of chemistry of 244 deceased, world-renowned chemists (listed by Prof. Hilditch), Lehman found that the peak of creativity was reached in the early thirties; in the 30 to 34 year interval. A change in the death rate would have made little difference. Median age of chemists at the time of making their important contributions was 35.9,

[7] The point was raised here by a member of the audience that these are qualities needed only in high level jobs, and there are not enough of such jobs to go around. But the studies discussed in this paper show that these are qualities desired and needed in any job. They are the very qualities listed by employers of older blue-collar workers as being assets on their jobs—jobs which certainly are not top-drawer ones.

[8] Lehman, Harvey C., *Age and Achievement*. Princeton University Press, 1953.

while their median age at death was 70.3.

These results were true generally in all fields studied. At the same time, Prof. Lehman found that leadership skills reached their peak at much later ages.

But note these points: (1) the decline is much slower than the incline. For example, the 25-year level on the curve of creativity of the 244 chemists is not again matched until about age 47; the early twenties level is not again reached until about age 60.

(2) The 30-34 group exceeded the next group by only a very small margin. A few more contributions by the 35-39 group or the one beyond that, and a few less by the 30-34 group would have changed the peak of the curve to a later interval.

(3) Individual differences were again very marked. Some chemists did not make their most important contributions until after they had passed age 40.

(4) These data measure creativity only as evidenced by published material.

(5) These are the cream of the cream of achievements in chemistry. Many other useful and needed achivements are being made which need not rank with these contributions.

Individual Differences

If a chemist has not made an important contribution by age 40, does this mean he never will? To answer this, Lehman studied 100 of the chemists who had made one single contribution (dated by Hilditch). Thirty-four per cent made their first and only contribution after they had passed 40; 19 per cent after 50; 5 per cent after 55; and one individual made his at 69. Lehman concludes: "These individual differences suggest that it would be futile to attempt to ascertain the one chronological age level at which the chemist's social and scientific usefulness is at an end. *Indeed, there probably is no such age level*"[9] (Italics mine.)

Job Demands

Another point that should be considered is, what do employers of industrial chemists want? Have they done a job analysis to see what qualities their positions require? Do they want only research and creative capacity? Or do they want, along with research and creative capacity, skill, experience, ability to lead, good judgment, precision? If so, the mature chemist has an advantage.

Conclusion on the Employability of Chemists Over Forty:

1. The chemist over forty, by the very nature of his work, capitalizes on the assets of older persons, and at the same time is not penalized by the liabilities such as declining speed and power.

2. The chemist over forty will find himself more and more in demand as the population continues to age and the employer faces an older and older labor force.

[9] Ibid., p. 14.

3. Since studies show that individual differences in abilities are far more marked than age differences, the chemist should be judged on the basis of his ability and not his age.

4. If employers want, along with creative ability, leadership, ability to guide, good judgment, and reliability, they should balance their work force with the more mature chemist.

5. Since tests show that the maintenance of mental abilities and learning power is a function of initial intelligence and continued learning, the intelligent chemist who continues to exercise his learning abilities is a good bet for industry, at any age.

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Honored: Dr. Ernest H. Volwiler, F.A.I.C., who has been chosen to receive the Chemical Industry Medal for 1954, "for conspicuous services to applied chemistry," by the American Section of the Society of Chemical Industry. Formal presentation of the medal to Dr. Volwiler, president of Abbott Laboratories, North Chicago, Illinois, and chairman of the Board of Directors of the American Chemical Society, will take place at a meeting of the American Section at the Conrad Hilton Hotel, Chicago, October 12, 1954. Dr. Clifford F. Rassweiler, F.A.I.C. vice chairman of the American Section and vice chairman of the Board of Johns-Manville Corporation, New York, N. Y., will preside at the award meeting, and Dr. Lauren B. Hitchcock, F.A.I.C., chairman of the American Section and president of the Southern California Air Pollution Foundation, Los Angeles, Calif., will present the medal.

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National Council Meetings

A meeting of the AIC National Council is scheduled to be held at The Chemists' Club, 52 East 41st St., New York, N. Y., at 6:00 p.m. on the following date:

June 16, 1954

May 12, 1954 — Asbury Park

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Emeritus House: A project proposed by Dr. Alexander Silverman, Hon.AIC, before the Pennsylvania Academy of Science, Pittsburgh, Pa., April 17th. "Emeritus House" would be a building constructed near a library center to furnish office and study facilities for professors emeritus. After the establishment of the first one, say in Pittsburgh, other "Emeritus Houses" could be created in other centers over the United States.

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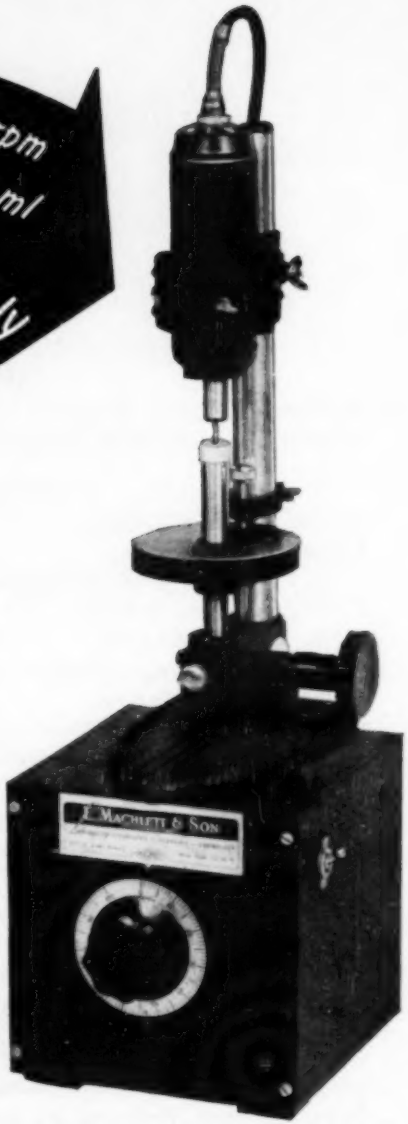

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Representative to National Council, Dr. Albin H. Warth

March Meeting

On March fourth at a dinner meeting at The Marylander, Dr. W. C. Hueper, M.D., chief, Cancerogenic Studies Section, National Institute of Health, Bethesda, Md., delivered an interesting lecture on "Enviromental Cancer." Many statistical slides and the description of many cases of experimental cancer enlivened the discussion. A large and enthusiastic audience attended the meeting.

New Jersey Chapter

Chairman, Dr. H. W. Mackinney
Chairman-elect, Dr. Cecil L. Brown
Treasurer, Dr. W. A. Raimond
Secretary, Dr. W. R. Sullivan
Representative to National Council, Dr. J. B. Allison

Annual Meeting

The Annual Meeting of the New Jersey Chapter was held at the Military Park Hotel, Newark, N. J., April 27th. The 1954 Honor Scroll was presented to Prof. Peter van der Meulen, director of the School of Chemistry, Rutgers University, by Dr. J. B. Allison, Dr. D. L. Cottle spoke for the recipient. Prof. van der Meulen's acceptance address was entitled, "A Chemist Looks at Educational, Industrial, and Community Life."

Student medals were awarded to outstanding students from Princeton, Rutgers, and Seton Hall.

The officers listed above were elected for the year 1954-1955, and in addition the following Chapter Councilors were elected: Dr. Max Bender, T. R. Donlan, W. F. Goepfert, Dr. E. R Hanson, Dr. R. W. McLachlan, Dr. A. B. Scott, R. H. Seavy, and D. W. Young.

New England Chapter Honor Scroll

The Honor Scroll of the New England Chapter will be presented to Prof. Avery Ashdown, May 26th, at a dinner at the M.I.T. Faculty Club, in recognition of his many years of service to the chemical profession.

Ohio Chapter

Chairman, David M. Gans
Chairman-elect, Malvern J. Hiler
Secretary-Treasurer, Harold M. Olson
Council Representative, Guy A. Kirton

Annual Meeting

The Annual Meeting of the Ohio Chapter was held in Louisville, Ky., April 9th, at which the Ohio Award was presented to Dr. J. S. Long of Devoe & Raynolds Company (See page 175).

In addition to the officers listed above, the following district directors were elected for the year 1954-1955:

Akron District Director, Eakin M. Glymph.
Cincinnati District Director, Elton S. Cook.
Cleveland District Director, Edward G. Bobalek.
Columbus District Director, Joseph H. Koffolt.
Dayton District Director, Nicholas N. T. Samaras.
Kentucky-Tennessee District Director, James E. Magoffin.
Director at Large, Albert A. Dietz.

Western Chapter

Chairman, Peter Stupin
Vice-Chairman, Dr. Kenneth Newman
Secretaries Miss Blanche C. Simons, 718 North Fairfax Ave., Los Angeles 46, Calif.
Tom Rollins, Keldon Research, Los Angeles 54, Calif.
Representative to National Council, Dr. L. F. Pierce

Social Meeting

The Western Chapter held a social meeting, February second, at the Eastside-Pabst Brewery in Los Angeles. Oliver Zobelein, public relations director of Eastside, was host.

The meeting was well attended by members and their guests. Mr. Zobelein arranged guided tours through the modern brewery. The highlight was examination of an $18,000 miniature pilot plant, which is a scale replica of the entire brewery operation. This model carried out all of the processes of brewing and included explanations of each step from treatment of the grain to the final bottling process.

The brewery bar was open during the evening and a buffet supper was served following the plant tours. After dinner, Chairman Pete Stupin introduced distinguished visitors and new officers. Mr. Zobelein then briefly commented on the history of the Eastside Company and explained many facts on present methods of brewing employed in their plant.

The meeting then resumed a social atmosphere to permit prospective AIC members to get acquainted with the organization, its aims, and activities.

Chemists in the Aeronautical Industry

At the April 8 meeting of the Western Chapter, Frank B. Bolte, chief of the Engineering Laboratories, Northrop Aircraft Company, discussed "The Chemist's Position in the Aeronautical Industry."

Recent years have seen a tremendous growth in the aeronautics industry. The importance of chemists in this growth is not often recognized. At present, the need for chemically trained specialists is greatest in the field of non-metallic materials for aircraft. Chemists are providing valuable service in the development of cleaning materials, paints and other protective coatings, plating operations, chemical analyses, and devising applications for plastics. Chemical manufacturers and aircraft chemists are working together to make use of new products such as synthetic lubricants and adhesives. Based on the present industry, the future for chemists in aircraft companies is very bright. With improved jet planes many problems need to be solved involving resistance to high temperatures in the propulsion motors, strong structural members, and new jet fuels.

The next meeting of the Western Chapter is scheduled for May 27th, at which time outstanding graduates from the local colleges will be given awards. Dr. Robert Vivian, dean of engineering at the University of Southern California, will receive the Honor Scroll. As guest speaker, he will discuss his recent travels in Thailand, Indo-China, and other areas of the Far East.

Washington Chapter

Chairman, Alexander Leggin
Vice Chairman, P. E. Reichardt
Treasurer, John Williams
Secretary, Wesley Koster, National Production Authority, Washington 25, D.C.
Representative to National Council, Alexander Leggin

Federal Financial Aid to Education

The Washington Chapter met March 9, 1954, at luncheon. The speaker was Paul A. Scherer, executive officer, Carnegie Institution of Washington, who presented the following subject for discussion: Should the Government Provide Greater Financial Aid to Universities for Pure Scientific Research? Various aspects of this problem were brought out, including the financial needs of the universities, the increasing dependence of the latter upon assigned research projects under contract with private industry, the nuisance and inconvenience associated with the "red tape" of government contracts and procedures, etc. A great deal of interest was aroused among those present, since representatives of industry, government, and universities, all took part in the proceedings. Time did

not permit exhaustion of the subject nor the reaching of a conclusion.

After suggesting that those interested in further discussion meet privately, the meeting was adjourned by the chairman, Alexander Leggin.

For Your Library

Ion Exchanges in Analytical Chemistry

By Olof Samuelson. John Wiley & Sons, Inc., 1953. 291 *pp.* $6.50.

This is the first book to explain the new and simple techniques of analysis and separation by use of the ion exchange method. Here are ways to produce more reliable analytical results; find new methods for analyzing technical products and substances; purify analytical reagents; recover valuable reagents; and use ion exchanges for analytical separations.

Dr. Samuelson, at present professor of engineering chemistry, Chalmers Institute of Technology, Goeteborg, Sweden, has had much practical experience in the textile and organic fields. One of the first chemists to appreciate the significance of the ion exchange method, he was recently awarded the Gold Medal of the Royal Swedish Academy of Engineering Sciences for his work on this subject.

Since much of the information concerning the ion exchange method of analysis has been published in periodicals having limited distribution, this book will be invaluable to the analytical chemist.

—Dr. Frederick A. Hessel, F.A.I.C.

Radioactivity Applied to Chemistry

By Wahl and Bonner. John Wiley & Sons, Inc. 6¼" x 9¼". 604 *pp.* $7.50.

A comprehensive treatise on the use of tracer isotopes, utilization, detection and measurement. The use of isotopes presages a complete re-examination of the data and theories of chemistry and physics. Included as a second part of the book are a series of summaries, arranged according to subject, of the types and sources of information concerning the application of radioactivity to chemistry.

—Dr. John A. Steffens, F.A.I.C.

Chemical Methods in Industrial Hygiene

By F. H. Goldman and M. B. Jacobs. Interscience Publishers. 274 *pp.* 4¾" x 7". $3.75.

This book is for the specialist in the field. It is concerned with the analytical problems of the industrial hygiene chemist. The authors have presented clearly and in detail methods and techniques which are the result of long experience and familiarity with the analytical difficulties peculiar to the industrial environment. The procedures outlined do not require special or expensive equipment, a valuable feature for industries with limited analytical resources.

—H. B. Wyckoff

Methods of Vitamin Assay

Second Revised Edition. Association of Vitamin Chemists. Interscience Publishers, Inc. 300 *pp.* 6¼" x 9½". $5.50.

An excellent reference book containing conservative and authoritative descriptions of methods of assay of vitamins. The procedures are such as to assure good results in regular laboratory practice.

The Proteins; Chemistry, Biological Activity & Methods

Vol. 1, *Part B. H. Neurath and K. Bailey, Editors. Academic Press, Inc.* 549-1115 *pp.* 4½" x 6½". $13.00.

The present five chapters include: The size, shape and hydration of protein molecules; protein interactions; protein denaturation; the chemical modification of proteins; the relation of chemical structure to the biological activity of the proteins; author and subject index to Volume I. Progress made in the respective fields of proteins has been thoroughly covered. The physical and chemical procedures employed have been well described by competent investigators.

—Dr. Henry Tauber, F.A.I.C.

Thermal Diffusion in Gases

(*Cambridge Monographs on Physics.*) *By K. E. Grew and T. L. Ibbs. Cambridge University Press.* 143 *pp.* 5¾" x 8¾". $4.50.

The use of thermal diffusion in the separation of the isotopes of chlorine by Clausius and Dickel dramatically showed its value. This volume considers the theory and practice of thermal diffusion.

—Dr. John A. Steffens, F.A.I.C.

Chemical Books Abroad

Rudolph Seiden, F.A.I.C.

Springer-Verlag, Berlin W 35; *Biologie und Wirkung der Fermente;* 1953, 176 pp. (32 ill., 1 table), paper covers DM 9.60.—A reprint of the 8 lectures and discussions held at the symposium of the Society for Physiological Chemistry in Germany in 1953; the lecturers dealt with the biology of enzymes; proteins as carriers of ferment action; carbohydrate metabolism; endopeptidases; mode of operation of dehydrogenases; carbohydrases; etc.

Theodor Steinkopff, Dresden: *Lehrbuch der organischen Chemie,* by W. Langenbeck; 14th ed., 552 pp., DM 15.—In September, 1950, the 8th edition of this book was reviewed in this journal. Since then, 6 editions have been published with only minor changes—proof enough that "Langenbeck" has become a leading text in the field of organic chemistry.

Dr. Dietrich Steinkopff, Darmstadt: *Thermodynamische Grundlagen der physikalischen Chemie,* by H. Schunck; 1953, 258 pp. (108 ill.), paper covers DM 31.—The thermodynamic principles of physical chemistry are explained in a "how to do it" manner, so that chemists and engineers should have no difficulties in learning to apply the basic facts and formulas of thermodynamics in their daily work.

Verlag R. Oldenbourg, Munich: *Allgemeine und chemische Thermodynamik,* by A. Oppitz; 1952; 280 pp. (135 ill.); DM 27.50.—A text and reference book for students, engineers, and physicists dealing with the theories and applications of thermo-dynamics; it contains 64 examples furnishing practical illustrations of the fundamental principles discussed in the text. • *Einfuehrung in die Kernphysik,* by W. Riezler; 5th ed.; 340 pp. (134 ill. and 1 colored table); DM 24.—This introduction into nuclear physics (including radioactivity) is widely read, probably because it succeeds in explaining the most difficult problems with a very minimum of mathematics, but using numerous tables to support the text. A clear, readable representation of a difficult subject matter.

Walter de Gruyter & Co., Berlin W 35: *Tonerde und Aluminium,* II: *Aluminium,* by W. Fulda and H. Ginsberg; 1953; 358 pp. (264 ill., 43 tables); DM 44.—While part I of this work deals with alumina (see The Chemist, November, 1952), this volume surveys all that is known about the production of Al and Al alloys through electrolysis and casting; utilization of waste products; mechanical shaping; and chemical surface treatment.

Advisory Committee: Established by the National Science Foundation, Washington 25, D.C., to consider the effects of government support to colleges and universities on their research and teaching functions. Chester I. Barnard is chairman. Statistics indicate that during the year ending June 30, 1952, educational institutions received almost $300-million from Federal agencies for development and research. Approximately 46 per cent was spent by instructional departments. Of the rest, about $3-million was spent by affiliated research organizations; $12.5-million by agricultural experiment stations, and $143.5-million by research centers, which were administered by educational institutions for specific Federal agencies but organizationally segregated from the normal activities of the institutions. A total of 225 educational institutions received some Federal support for development and research.

Columnist: Mark M. Luckens, F.A.I.C., who is preparing a monthly column, "Industrial Hygiene Data Sheets," for *Safety Maintenance and Production*, published in New York.

Please Note

The listing on page 157, April CHEMIST, for Dr. G. H. Benham, should read:

Benham, G. Harvey
Supervisor, Biochemistry Section
Armour Research Foundation
Technology Center, Chicago 16, Ill.

Petroleum Research Fund: Available in the form of grants for research. They will be made by the Board of Directors of the American Chemical Society to persons recommended by the newly-appointed Petroleum Research Fund Advisory Board, under the chairmanship of Dr. Cary R. Wagner, F.A.I.C. Proposals should be sent in triplicate to the Petroleum Fund Advisory Board, American Chemical Society, 1155 16th St., N.W., Washington 6, D.C.

Mattiello Lecturer: Dr. J. S. Long, F.A.I.C., educational director of Devoe & Raynolds Co., Louisville, Ky., who will present the lecture at the Annual Meeting of the Federation of Paint & Varnish Production Clubs, at the Palmer House, Chicago, Ill., Nov. 18-20, 1954.

Appointed: Paul B. Slawter, Jr., M.A.I.C., as vice president in charge of the Industrial Division of Sterling Advertising Agency, Inc., 535 Fifth Ave., New York 17, N.Y.

Speaker: Dr. F. J. Emmerich, Hon.AIC, president of Allied Chemical and Dye Corporation and vice-chairman of the Board of the Manufacturing Chemists' Association, who will address the Chemical Market Research Association, New York, N. Y., May 20th, on "New Chemical Markets for a Better America."

New Position: For Louis A. Goretta, M.A.I.C., who has joined the staff of the Whiting Laboratories of Standard Oil Company (Indiana), Whiting, Indiana.

Transferred: Philip R. Tarr, F.A.I.C., from the St. Louis office of Monsanto Chemical Company, to the development department of the Plastics Division of Monsanto at Springfield, Mass.

Opened: Sales and service offices at 230 North Michigan Ave., Chicago, Ill., by the Perkin-Elmer Corporation, to serve ten Midwestern states.

Will You Come

April 30, 1954. Chicago Chapter. Engineers Club. Speaker, Dr. Robert L. Burwell, chairman, Dept. of Chemistry, Northwestern University, "Problems of Young Chemists." Award of Student Medals to outstanding chemistry students of area.

May —, 1954. (Day to be announced). Meeting of Louisiana Chapter, New Orleans, La. Award of first Honor Scroll to Prof. Paul Bailey, F.A.I.C., of Loyola University, New Orleans, 18, La. For information: Harold A. Levey, 8127-33 Oleander St., New Orleans 18, La.

May 6, 1954. Pennsylvania Chapter. Engineers Club, Philadelphia. Speaker Dr. W. R. Bender, Manager Personnel Research Section, Employee Relations Dep't., E. I. du Pont de Nemours & Co., "New Trends in Personnel Relations." Student Medal Awards to outstanding, college seniors.

May 11, 1954. Niagara Chapter. Dinner Meeting. Symposium on Atmospheric Pollution. Speakers: Niagara Falls Pollution Control Inspector, Arnold Arch; Niagara Falls Commissioner, Robert B. MacMullen; City of Buffalo Smoke Inspector Quinlan, and Erie County Supervisor, Al Geise. Student medals to be awarded to outstanding students in the area.

May 12, 1954. Washington Chapter. Luncheon meeting. New Athens Restaurant, Washington, D.C. 12:15 p.m. Election of officers. Activities planning.

May 12, 13, 14, 1954. AIC Annual Meeting. Berkeley Carteret Hotel, Asbury Park, N.J.

May 18, 1954. (Tuesday) 9:00 to 9:30 p.m., AIC broadcast on WATV—Channel 13, as part of the New Jersey "Know Your State" television series. Entitled, "It's Chemists Serve You," the program features Dr. Lincoln T. Work, AIC president; Dr. William J. Sparks, 1954 AIC Gold Medalist, and Robert

M. Thomas, co-inventor of Butyl rubber. Moderator: Robert McDougall, director of educational programs for WATV.

May 20, 1954. New York Chapter Annual Meeting. Hotel Commodore, New York, N. Y. Reception, courtesy of Eastman Kodak Company, 6:30 p.m. Dinner 7:30 p.m. Presentation of the Chapter's Honor Scroll to Dr. Hans Thacher Clarke, F.A.I.C., professor of biochemistry and head of the department, College of Physicians and Surgeons, Columbia University, New York, N. Y. Speaker for the Recipient, Dr. Edgar G. Miller, Jr., dean of Graduate Studies at Columbia University. Karl M. Herstein, chairman of the Chapter, will present the Honor Scroll.

May 26, 1954. New England Chapter. M.I.T. Faculty Club, Cambridge, Mass. Dinner 6:30 p.m. Presentation of Honor Scroll to Prof. Avery Ashdown. Student Awards to students from colleges in the Metropolitan Boston area. For information, Richard S. Robinson, Arthur D. Litttle, Inc., 30 Memorial Drive, Cambridge, Mass.

May 27, 1954. Presentation of the Honor Scroll of the Western Chapter to Dr. Robert Evans Vivian, dean, College of Engineering, University of Southern California, Los Angeles, Calif. For information: Dr. Romeo P. Allard, Department of Chemistry, Loyola University, Los Angeles 45, Calif.

June 4, 1954. Chicago Chapter. Dinner $3.25 per person) 6:30 p.m. Mixer, 6:00 p.m. Meeting 7:30 p.m. Chicago Engineers Club, 314 South Federal St. Speaker, Dr. William F. Egerton, Department of Oriental Languages, University of Chicago, "Professional Guilds. What They Are. What They Do." For reservations (open to AIC members only): William W. Ross, Armour & Co., 1425 W. 42nd St., Chicago, Ill. (YArds 7-4100, Ext. 384.)

May 12, 13, 14, 1955. AIC Annual Meeting. Chicago, Illinois. The Chicago Chapter has appointed Clifford A. Hampel to initiate arrangements.

May, 1956. AIC Annual Meeting. Tentatively scheduled for Washington, D.C.

Opportunities

Doris Eager, M.A.I.C.

AIC members who are seeking positions may place notices in this column without charge.

Chemists Available

Research & Development Executive: Organic Ph.D. Registered professional engineer, F.A.I.C. Present head of chemical research and development section of internationally known firm seeks growth position in research coordination, direction or management. Broad spectrum scientific background. Box 50, THE CHEMIST.

Research Chemist: F.A.I.C. Ph.D. Age 30. Four years experience in developing and improving manufacturing processes of aromatic intermediates and fatty acids. Box 52, THE CHEMIST.

Production Supervisor. F.A.I.C. 8 years experience as plant manager, technical director, bitumens and industrial chemicals. Prefers position with small chemical manufacturing concern. Box 54, THE CHEMIST.

Organic Chemist: F.A.I.C. Ph.D. 1945. Diversified experience, including supervisory, in synthesis and process development from laboratory through full scale production. Special training and experience in pharmaceuticals including formulation of new dosage forms and quality control. Publications. Age 34, family. Location immaterial. Box 56, THE CHEMIST.

Consultant, Industrial. F.A.I.C., B.S., M.S., and near Ph.D., available for industrial consultation, research, development, liaison, plant or customer service work in organics, plastics, resins, drugs and many allied fields. Over 15 years experience in industry, highest references. Past 5 years directed own laboratory, desire new contacts. Willing to travel to most areas, currently located in East. Box 58, THE CHEMIST.

Administrative Engineer: F.A.I.C., B.Ch.E. 13 years chemical, fermentation, allied industries in project and plant engineering, process development. Chief engineer, consultant, successful at training and supervising engineering and production personnel. Licensed professional engineer. Age 36. Box 500, THE CHEMIST.

Chemical Executive. Age 33. Scientific and business knowledge in plastics, resins, pharmaceuticals, foods, etc. 14 years of progressively difficult work. Past 9½ years, director of chemical laboratory conducting research-development, product evaluation, quality control. Box 502, THE CHEMIST.

Positions Available

Chemists; Physicists; Metallurgists; Mathematicians; Electronic Scientists. $3,140 to $10,800 a year. Appointment in Washington, D.C. and vicinity. Request Announcement No. 325 and supplements, from U.S. Civil Service Commission, Washington 25, D.C.

Chemists, GS-9 thru GS-15, $5,060 to $10,800 per year. Optional fields include biochemistry, organic chemistry, organic coatings, pharmaceutical, inorganic, physical, metallurgical, rubber. Write Executive Secretary, Board of U. S. Civil Service Examiners, Army Chemical Center, Maryland, for Announcement No. 3-112-2 (1954).

Condensates

Ed. F. Degering, F.A.I.C.

A detective with his murder mystery, a chemist seeking the structure of a new compound, uses little of the formal and logical modes of reasoning. Through a series of intuitions, surmises, fancies, they stumble upon the right explanation and have a knack of seizing it when it once comes within reach.

—GILBERT LEWIS

Light colored clothing such as orange, white, or yellow, according to research by Sun Chemical Corp., tends to repel mosquitoes whereas they are attraced by dark blue, brown, and red.

The oil industry employs more than 17,000 college-trained engineers and scientists.

Not all the advances of pure science have been felt in the market place, but a growing number of the laboratory curiosities reported much earlier have become full-fledged consumer products—or industries—in their own right.

—INDUSTRIAL BULLETIN

A soft magnetic alloy of aluminum and iron, known as 16-Alfenol, was developed by the magnetic division of the Naval Ordnance Laboratory.

The application of a new selective solvent technic for the separation of the rare earth elements will tend to make them less rare.

Detergent production figures rose during the last five years from 400 million to 1.8 billion pounds per year.

The main factors contributing to heart disease, according to the National Institute of Health, are: Emotional tension, high pressure, overeating, and inadequate rest.

Ammoniated hemicellulose extract, by-product of wallboard manufacture may be used as a partial substitute for protein in dairy cattle feed.

Something New

"Resistance of Cements to 297 Chemicals." Chart. Corrosion Engineering Dept., Pennsalt Chemicals, 1000 Widener Bldg., Philadelphia 7, Pa.

"Edscorp Pocket Comparator." Information. Edmond Scientific Corp., Barrington, N. J.

"Copper Purifier for copper plating baths." Information. Sel-Rex Precious Metals, Inc., 229 Main St., Belleville 9, N. J.

"Labline Duo-Vac Oven." Information. Labline, Inc., 217-221 N. Desplaines St., Chicago 6, Ill.

"Zein." Bibliographic Bulletin No, 7. Mellon Instiute, 4400 Fifth Ave., Pittsburgh 13, Pa.

"Improved Hot Plate." Information. Glenn Electric Heater Corp., 254-258 Canal St., New York 13, N. Y.

"Polyethylene Laboratory Ware. Bulletin 114. Arthur H. Thomas Co., P. O. Box 779, Philadelphia 5, Pa.

"Performance of Wire Mesh De-misters." Booklet. Otto H. York Co., Inc., 69 Glenwood Place, East Orange, N. J.

"Diffraction Gratings." Monograph. Bausch & Lomb Optical Co., Rochester 2, N. Y.

"Sodium Pentachlorophenate." Pest Control in Laboratory Lots. Fisher Scientilc Co., 717 Forbes St., Pittsburgh 19, Pa.

"Technical Films." Circular. Princeton Film Center, Inc., Princeton, N. J.

"Squeeze Bottle—Ion Exchange for Distilled Water." Circular. Central Scientific Company, 1700 Irving Park Road, Chicago 13, Ill.

"Precision Ionograph." Bulletin 690. Precision Scientific Co., 3737 M-Cortland St., Chicago 47, Ill.

"Thermocouples." Catalog 1530. Conax Corporation, 4515 Main St., Buffalo 21, N. Y.

"Eclipse Burmix Burners," Low Pressure Gas & air. Eclipse Fuel Engineering Co., 1001 Buchanan St., Rockford, Ill.

"Small Boilers New Model." Information. Cleaver-Brooks Co., 326 E. Keefe Ave., Milwaukee, Wis.

"Special Function Gages & Valves." Information. Jerguson Gage & Valve Co., 87 Fellsway, Somerville 45, Mass.

"V-4007 Electromagnet & V-2200 Power Supply." Special Products Sales Dept., Varian Associates, Palo Alto, Calif.

"Electric Ovens, Water Baths, Lab-Heat Furnaces." Bulletin 1153. Blue M Electric Co., 306-308 W. 69th St., Chicago 21, Ill.

"New Stone Grinding Mill." Information. Lee Engineering Co., 2023 W. Wisconsin Ave., Milwaukee 3, Wisconsin.

"Automatic Filling Scale." Catalog Sheet of Model 600G. Floyd L. Thayer, Thayer Scale & Engineering Corp., East Water St., Rockland, Mass.

"2,4-D For Weed Control." Technical Bulletin No. 0-50. Monsanto Chemical Co., Organic Chemicals Division, St. Louis 1, Mo.

"Services, that Floor Us" Booklet. Foster D. Snell, Inc., 29 West 15th St., New York 11, N. Y.

"Cellulose Acetate." Booklet. Hercules Powder Co., Wilmington 99, Del.

"Contura." Portable photo-copy machine. Information. F. G. Ludwig, Inc. Box 1078, Deep River, Conn.

"New Chemicals Available." Information. Bios Laboratories, Inc., 17 W.60th St., New York 23, N.Y.

"Calculation of Liquid-Liquid Extraction Process," by Edward G. Scheibel of Hoffman-LaRoche, Inc. Bulletin 541. Reprint from I & EC. Available from Technical Librarian, York Process Equipment Corp., 69 Glenwood Place, East Orange, N. J.

"Hot-Metal Magic." Booklet. Electro Metallurgical Co., Div. of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

"Agilene (Polyethylene) Sink Trap." Information. American Agile Corp., P.O. Box 168, Bedford, Ohio.

"Chromotography & Paper Electrophoresis Apparatus & Equipment." Catalog No. Ac-54. Schaar & Company, 754 W. Lexington St., Chicago 7, Illinois.

"Process Equipment." Catalog. Process Equipment Department, Blaw-Knox Co., Pittsburgh, 22, Pa.

"Silastic Facts." Technical Data publication. Dow Corning Corp., Midland, Mich.

"Model 21 Double Beam Infrared Spectrophotometer." Brochure. The Perkin-Elmer Corp., Norwalk, Conn.

"Cenco High Vacuum Apparatus." Bulletin. Central Scientific Co., 1700 Irving Park Road, Chicago 1, Ill.

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proved BEST among organic

SEQUESTERING AGENTS

Comparisons have been made by a qualified laboratory, comparing: . . . **"Tetrine"**® versus a similar chemical claimed more effective for sequestering trace metal ions in aqueous solution. Extensive tests were conducted using **Glyco's Sodium Tetrine Liquid Conc.** and the latter material.

Tests were made under practical commercial use conditions of pH, concentration and time of contact . . . on iron, calcium and magnesium ions. Effectiveness in acid, alkaline and neutral solutions was determined. These agents were evaluated on **equal cost basis.**

these were the results for iron:

1.—Under acid and neutral conditions, "Tetrine" showed a slight to 40% superiority, depending on the application.

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2.—In tests using soap solutions and standard hard water, "Tetrine" was markedly superior in preventing hard water precipitation, and permitting the formation of foam where the other product did not.

These and other test results indicate that pure ethylenediamine tetraacetic acid and its sodium salts are definitely superior to all other commercial organic sequestering agents, for the elimination of the undesirable effects of trace metal ions in aqueous solutions.

Remember that **"Tetrine"** is the purest EDTA available commercially. For samples and further information, please address your request to Dept. 'C' Glyco Products Co., Inc., 26 Court St., Brooklyn 1, New York.

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in gleaming white porcelain

One of the most popular of U. S. Stoneware's line of Ceramic Vacuum Filters is this two-piece porcelain unit designed specifically for laboratory and pilot plant use.

Available in two sizes (top capacity 1 gallon or 2½ gallons), Figure 2070 B Filter is light enough to be easily portable, yet strong enough to withstand a complete vacuum. The perforated filter support plate is an integral part of the upper unit. The finish is as smooth and easily cleaned as a china dish. And being white chemical porcelain, the filter will handle all chemicals except hydrofluoric acid, and hot caustics.

U. S. Stoneware Ceramic Vacuum Filters are made in a wide range of types and in capacities ranging up to 100 gallons.

Write for Bulletin F-37 describing our complete line of Ceramic Vacuum Filters

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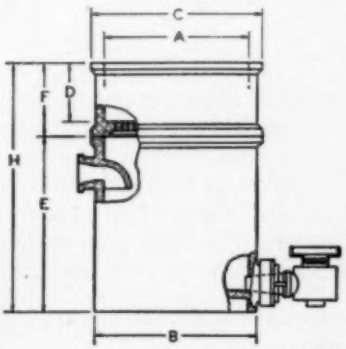
Akron 9, Ohio

Size	Dimensions, Inches A	B	C	D	E	F	H	Faucet Size	Capacity Gals. Top	Bottom	Weight Lbs. Top	Bottom
A	10	11	11½	4	12	5	17	½	1	2	10½	19½
B	12	13¼	13¾	6¼	16¼	7¼	23½	½	2½	5	20½	28½



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